



Legacy Data Management (LDM) in an Integrated Product Data Environment (IPDE)

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Seminar Outline

- Legacy Data in an IPDE
- Scoping the LDM Effort
- Producing a LDM Strategy
- Converting LD to Digital Form
- Sparse Document LD Change Methodolgy
- Deploying and Sustaining Digital LD
- Summary



Legacy Data in an IPDE

- Air Force IPDE concept
- Air Force Product Data Systems Modernization (PDSM) Program Office mission
- Legacy Data (LD)
- Legacy Data Management (LDM) hurdle
- LDM solution



Air Force IPDE Concept

- Shared data environment
- National and international focus
 - Data interchange standards
 - Best business practices
 - proven technologies
- Standard infrastructure
- Right data to the right user
 - Cost effective
 - Hardware independent
 - Accessible



Air Force IPDE Goal

- Product data
 - Engineering data/product definition data, technical manuals/training materials, and business data that support weapon system design, manufacture, test, operations and support
- To create a shared data environment
- To modernize technical data management systems
- To enable weapon system acquirers, users and maintainers to cost-effectively interchange and easily access digital product data



Air Force PDSM Program Office Mission

- Implement IPDE within the Air Force as Single Manager for Air Force PDSM
- Implement JCALS and JEDMICS within the Air Force
- Improve Technical Manual Specs and Standards
- Produce digital technical data management procedures
- Manage Air Force legacy Technical Orders (TOs) conversion to digital form
 - 16M TO pages, the tutorial focus



Legacy Data (LD)

- Legacy data are those data that have been delivered to a sustaining organization
- Air Force TOs are manuals, pamphlets, and illustrations or schematic diagrams used to operate and maintain Air Force weapon systems
- Air Force possesses 16 million pages of Air Force Legacy TOs
 - TOs formally delivered to the Air Force
 - Over 16 million pages are stocked, stored, and distributed as paper
 - Tracked by the G022 TO Management System



LDM Hurdles

- 16 million AF legacy TO pages in non-digital and in a variety of digital forms
- Majority of AF TOs in paper format costing \$9.5M/yr to store, print, and mail
- Change management of paper legacy TOs is cumbersome and costly
 - Automated TO System (ATOS)
 - Prime and overflow contractors
- How will non-digital and digital legacy TOs be managed in a digital environment?



LDM Solution

- Convert legacy data to a digital format compatible with JCALS
- Re-engineer current TO system to accommodate digital legacy data sustainment



Scoping the LDM Effort

- Defining the LD Customer
- Defining LD Quantities
- Defining LD Sources
- Defining “As-Is” LD Formats
- Defining “As-Is” LDM Infrastructure
- Defining “To-Be” LD formats
- Defining “To-Be” LDM Infrastructure



Scoping the LDM Effort: *Defining the LD Customer*

- TO Management Agency (TOMA)
- TO Distribution Organizations (TODOs)
- TO Distribution Account Managers (TODAs)
- Operation and maintenance TO Users



Scoping the LDM Effort: *Defining LD Quantities*

- One million TO pages are digitally maintained in the Automated TO System (ATOS)
 - Publication and document management system for Air Force TO page changes
 - Receives, stores, and maintains digital TO change page data and produces postscript TO pages
 - Consists of seven subsystems: production control, text capture, text generation, graphics capture, graphics generation, review and output
 - Operates at five Air Logistic Centers (ALCs)
 - Will be replaced by JCALS
- 240,000 paper TOs, amounting to 16 million pages, to be converted to a standard digital form



Scoping the LDM Effort: *Defining “as-is” LD Formats*

- Direct Image Copies
 - Reproducible master TOs from which copies may be photographed
 - Stored along with some TO negatives in TO warehouses at five AF Air Logistics Centers (ALCs)
- ATOS TOs are in MIL-M-ATOS format



Scoping the LDM Effort: *Defining "as-is" LDM Infrastructure*

- G022 System for distribution of paper TOs
- Automated TO Management System (ATOMS)
 - A part of G022 System
 - Performs TO requisitioning function
- ATOS for management of nearly 1 million MIL-M-ATOS-formatted TO pages



Scoping the LDM Effort: *Defining “to-be” LD formats*

- Indexed Portable Document Format (IPDF)
 - Standardized, platform independent digital format
 - View and print on demand functionality
 - Easy access to complete TO from a single file
 - Indexed to Table of Contents, List of Illustrations, imbedded references and indicies
 - Word search capability
- Most economical view, print on demand, and sustainment format
- Preferred Department of Defense (DoD) method



Scoping the LDM Effort:

Defining “to-be” LDM Infrastructure

- Joint Computer-aided Acquisition and Logistics Support (JCALS) System
 - TO management, acquisition, improvement, publishing, stockage, and distribution
 - Interchanges SGML and IPDF TOs
- Digital Legacy Data Storage System
 - Stores IPDF TOs
 - Is a hardware and software augmentation to the current ATOS system



Producing a LDM Strategy

- Identify the Air Force LDM challenge
- Declare Air Force LDM goals
- Define Air Force LDM assumptions
- Identify a LD conversion approach



Producing a LDM Strategy: *Identify the Air Force LDM Challenge*

- Maximize JCALS return on investment by converting legacy TOs to JCALS-compatible format
- Examine and re-engineer TO sustainment processes to accommodate digital TOs
- Deploy and sustain digital legacy TOs in a manner to support Air Force weapon system users and maintainers



Producing a LDM Strategy: *Declare Air Force LDM Goals*

- Produce a conversion approach for legacy data
- Provide formatting guidelines for LD
 - For JCALS compatability
 - For user utility
- Develop a methodology for sustaining digital LD
- Document above information in the Air Force Digital Data Strategy
 - Documents product data acquisition and legacy data conversion approach
 - Located at: <http://wpafb1.wpafb.af.mil/Strategy.html>



Producing a LDM Strategy:

Define Air Force LDM Assumptions

- TO page integrity must be maintained for reproduction and publication of page-oriented TOs
- Infrastructure constraints require that
 - Some TO users continue to use paper TOs
 - Interim solutions be combination paper and digital processes
- Current legacy TO sustainment processes will continue until JCALS is implemented



Producing a LDM Strategy: *Identify a LD Conversion Approach*

- ATOS complete TO books to be converted to JCALS-compatible format
- Prime and overflow contractor maintained TO pages to be converted to IPDF
- Examine TO inventory and account for all TOs that are already digital form
- Ensure that digital display devices can handle IPDF TOs
- Document above in TO Conversion Implementation Plan



Having scoped the LDM effort
Having built the strategy
Having defined the LDM forest
Its time to see the conversion trees

A Sonnet by Gerald



Converting LD to Digital Form

- Produce a conversion plan
- Establish a conversion operation
- Identify lessons learned



Converting LD to Digital Form:

Produce a conversion plan

- Define conversion approach
- Define parameters of conversion effort
- Document findings in a Conversion Plan



Converting LD to Digital Form: *Produce a Conversion Plan*

- Define conversion approach
 - Centralized versus decentralized
 - TO ordering
 - Priorities development
 - QA program definition
 - Process definition
 - Tracking mechanisms
 - Prototype testing requirements



Converting LD to Digital Form:

Produce a conversion plan

- Define parameters of conversion effort
 - Location of source data
 - Data managers
 - Available formats
 - Current management systems
 - Identification of points of contact
 - Life cycle phase of system



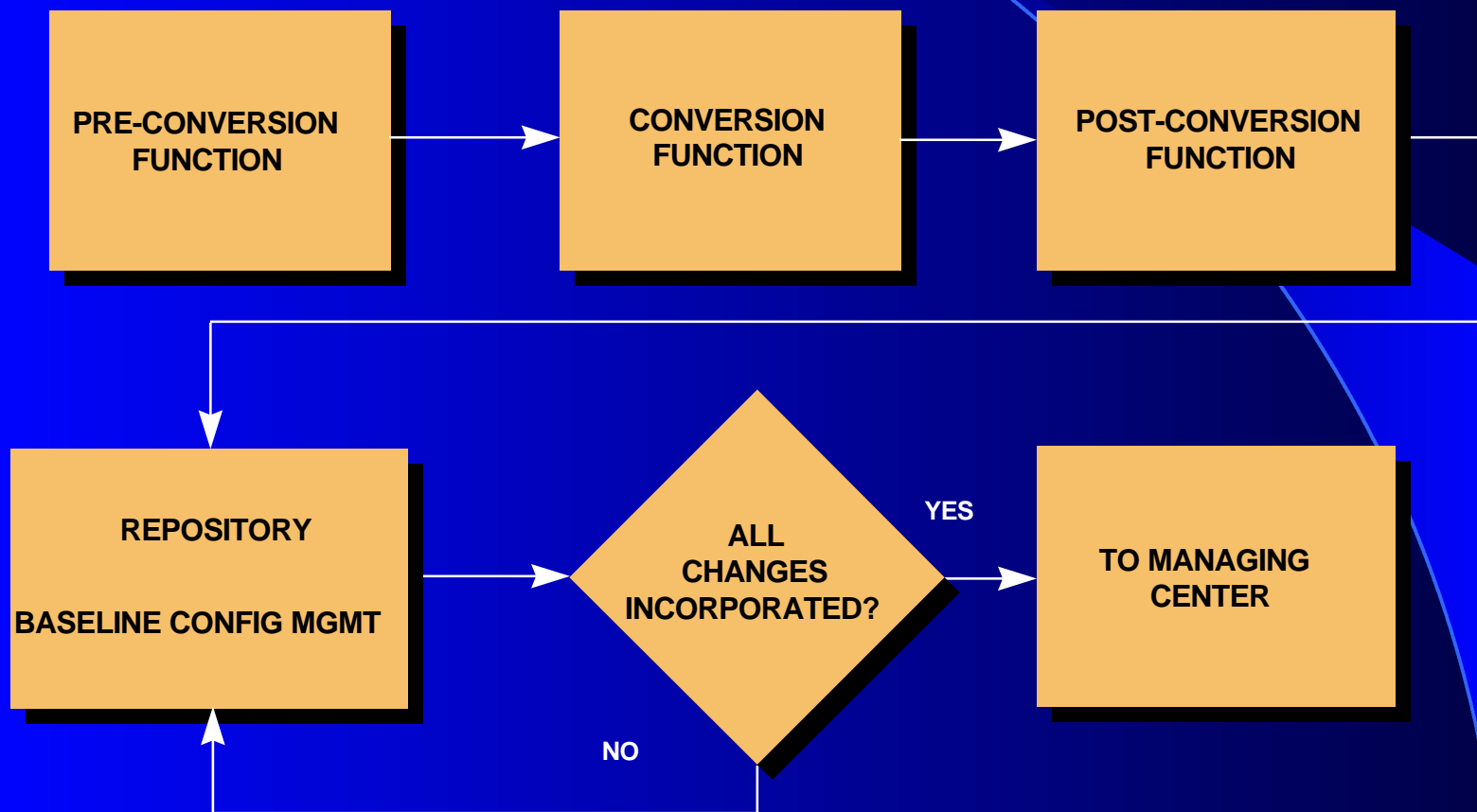
Converting LD to Digital Form:

Produce a conversion plan

- Document findings in a conversion plan
 - Formalizes decisions
 - Establishes priorities
 - Identifies metrics
 - Defines processes
 - Pre-Conversion
 - Conversion
 - Post-Conversion
 - Identifies tracking program
 - Establishes criteria
 - Provides schedule

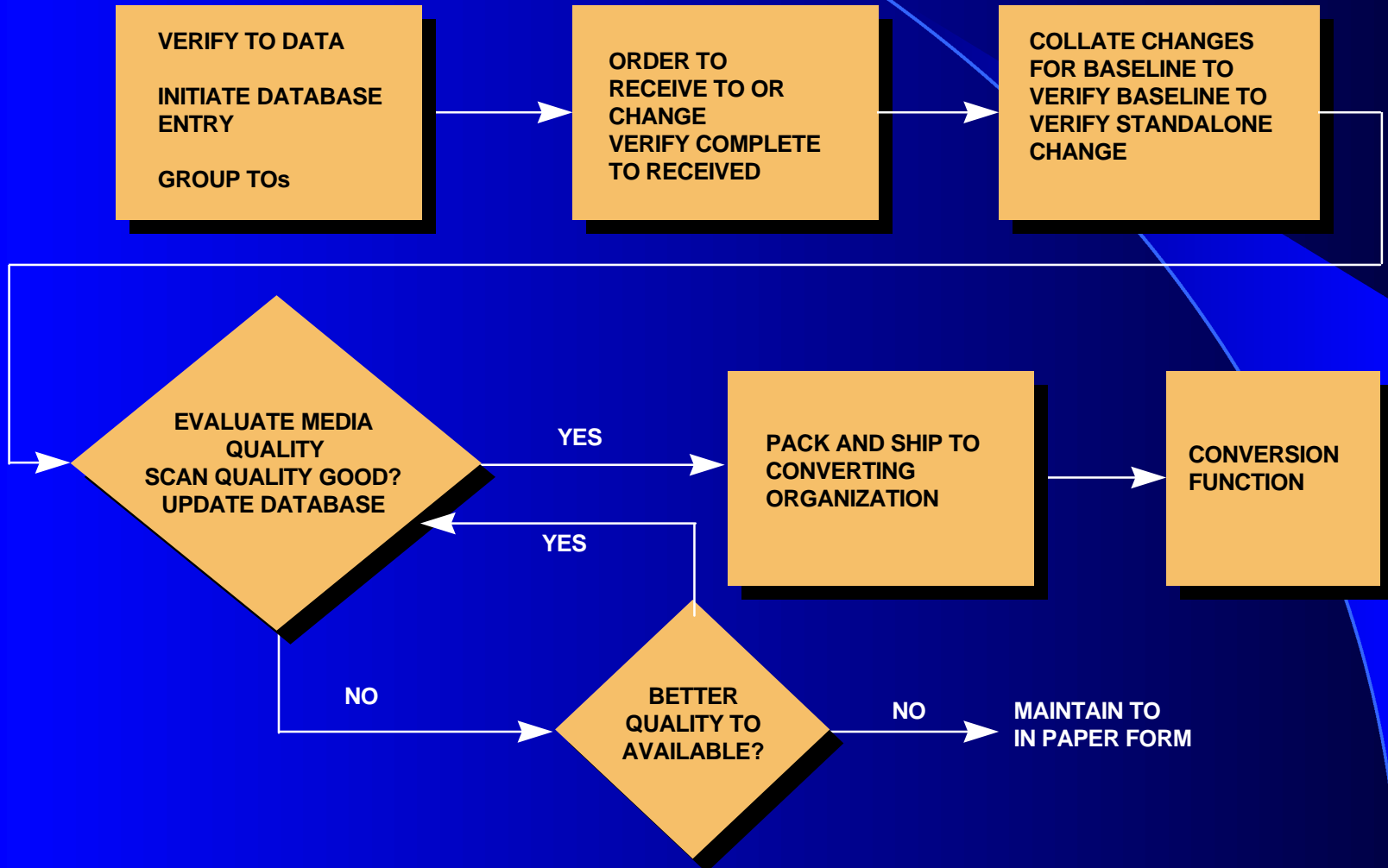


Conversion Process





Pre-conversion Function



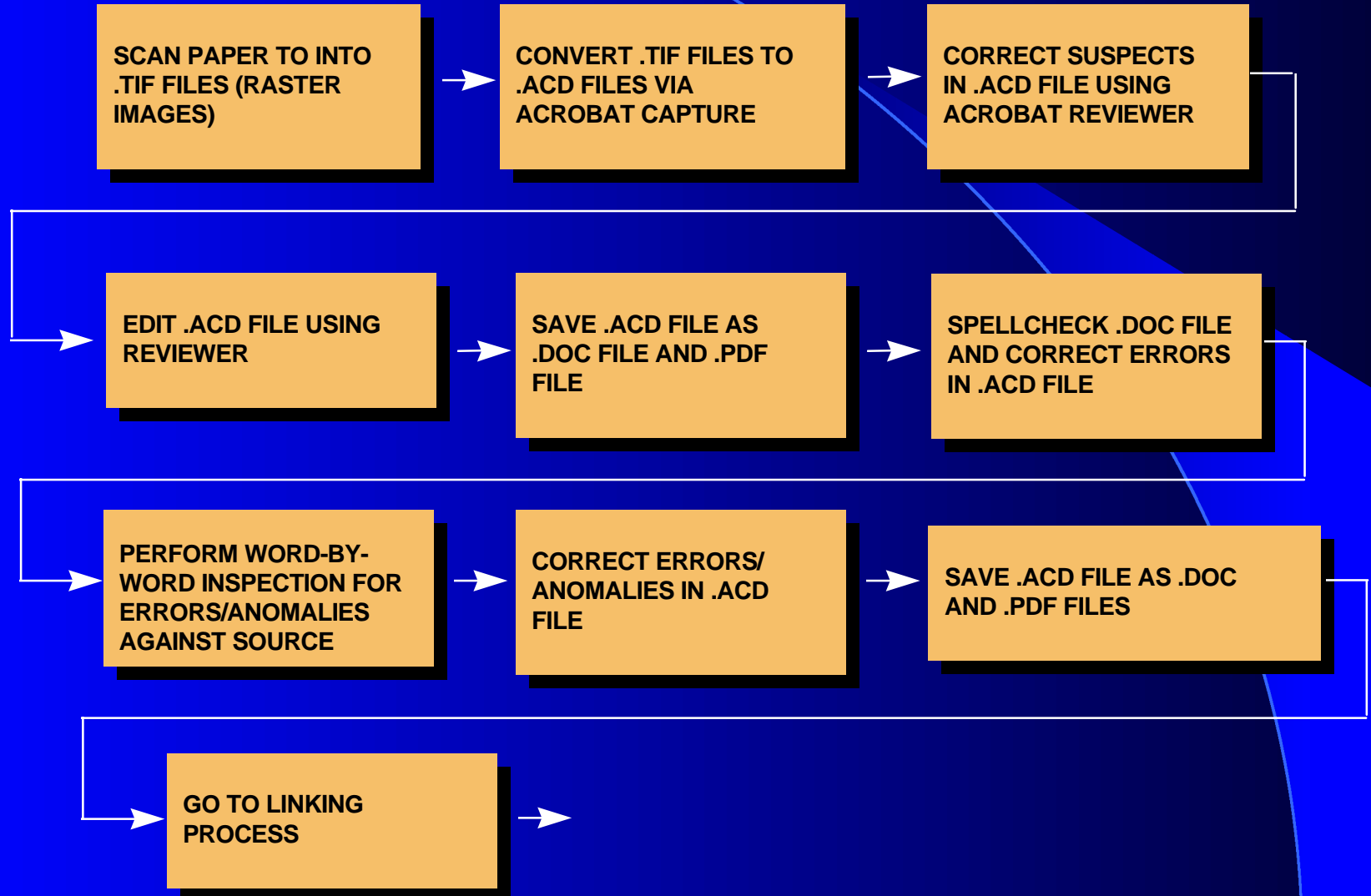


Conversion Function

- Performed by converting organization
- QA to Include:
 - Word searchable text
 - Indexing correct
 - Visual presentation identical to paper
 - No loss of technical content



Conversion Function





Conversion Function: Linking

LOAD TO INTO ADOBE
EXCHANGE
RUN INFOLINKER
PREPARE DOCUMENT

NAME DOCUMENT
WITH .RUL EXTENSION
COPY STANDARD
RULES SET

IDENTIFY TOC, LOF, LOT,
ETC., PAGES
RUN EDIT OCR ON PAGES
IDENTIFY PAGES AND
ZONES

UPDATE #PAGE
AND #ZONE

UPDATE RULES SET
FOR DOCUMENT
IDIOSYNCRACIES

RUN CLEAN OCR
RUN COMPILE
RUN UPDATE PDF

DISPLAY BOOKMARKS
CHECK FOR CORRECT
ORDER/DESTINATIONS

CHECK LINKS

COLLAPSE
BOOKMARKS

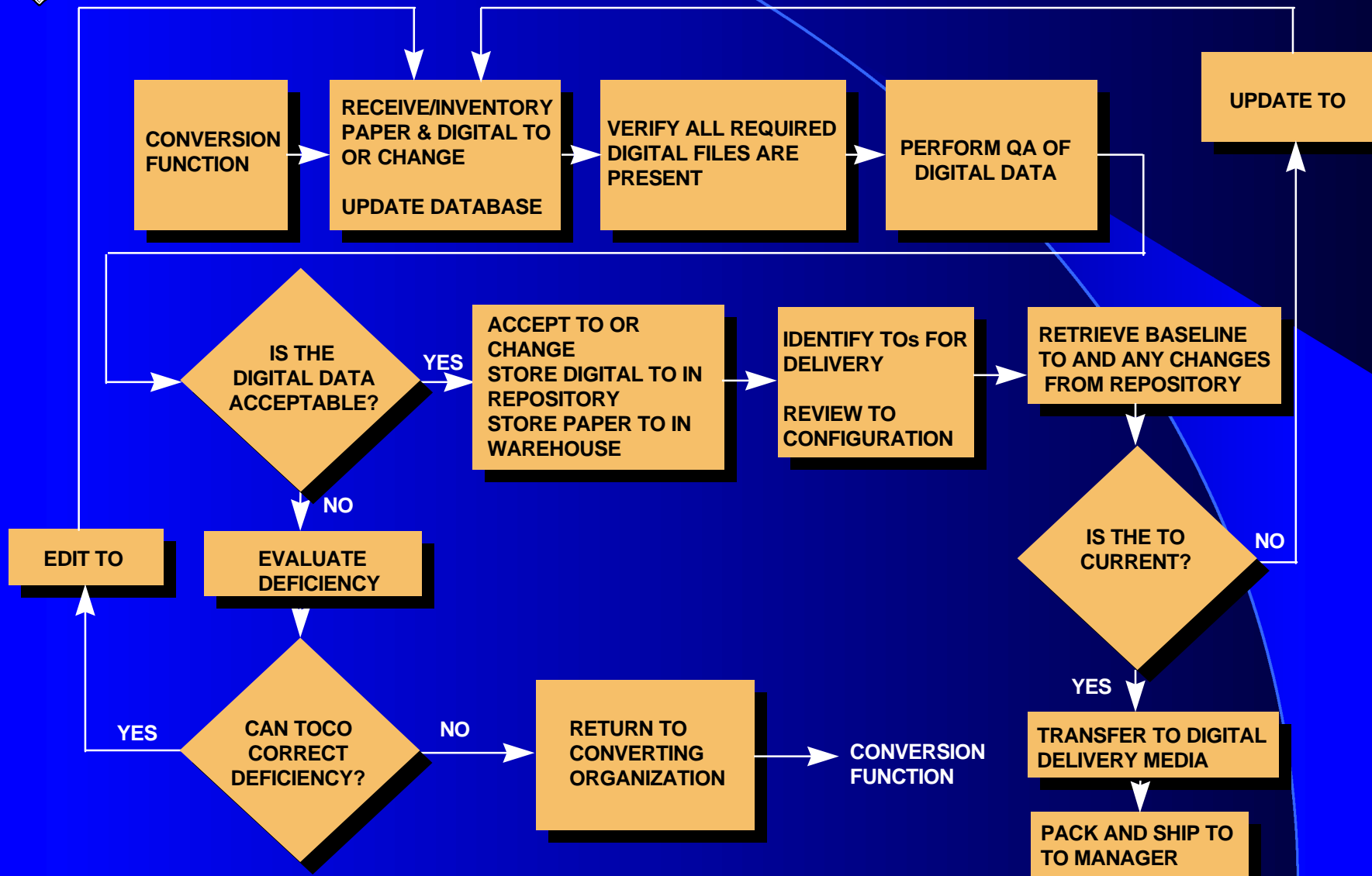
RUN LINK MANAGER
DELETE DESTINATION LINKS
MAKE SOURCE LINKS INVISIBLE

GENERATE THUMBNAILS
SET OPEN MODE TO "PAGE
PLUS BOOKMARKS"
SAVE FILE

GO TO POST-
CONVERSION



Post-conversion Function





Converting LD to Digital Form: *Establish a conversion operation*

- Define operational requirements
- Maintain configuration control
- Report production status



Converting LD to Digital Form: *Establish a conversion operation*

- Define operational requirements
 - Organizational structure
 - Resources (people and equipment)
 - Training
 - Prototyping
 - Process improvement
 - Production scheduling
 - Measuring progress



Converting LD to Digital Form: *Establish a Conversion Operation*

- Maintain configuration control
 - Changes issued after TO enters process
 - Track changes through the process
 - Merge changes prior to delivery
 - Transfer to TO Manager



Converting LD to Digital Form: *Establish a conversion operation*

- Report production status
 - Published on the World Wide Web
<http://www.pdsm.wpafb.af.mil/toco.html>
 - LD customers demand frequent status



Converting LD to Digital Form:

Identify lessons learned

- Leverage LD conversion experience
- Obtain customer's support
- Exploit technology
- Be prepared



Converting LD to Digital Form:

Identify lessons learned

- Leverage LD conversion experience
 - Other services
 - Conversion contractors
 - Project workers' experiences
 - Continuous process improvement
 - Testing results



Converting LD to Digital Form:

Identify lessons learned

- Obtain customer's support
 - Communicate early and often
 - Communicate progress to everyone
 - Work within the system
 - Work-arounds generally create problems in other processes
 - Work-arounds generally break down
 - Work with the people that are a part of the system



Converting LD to Digital Form:

Identify lessons learned

- Exploit technology
 - Use the forward edge of technology
 - Provide for technology insertion
 - Encourage vendor support
 - Engender customer support
 - Do not accept “Can’t”
 - Work smarter - not harder



Converting LD to Digital Form:

Identify lessons learned

- Be prepared
 - View preparatory functions as an investment
 - Remain flexible
 - New situation every day
 - Every rule has an exception
 - Not a “lights out” operation
 - Murphy’s law



- We have a *Digital Data Strategy*
- We have a *Conversion Plan*
- We have a *productive conversion operations facility*
- We have *digital legacy data*

NOW

We must manage change in the IPDF TO environment



Managing change in an IPDE

- Challenge

- Recognizing that IPDF designed as a view and print-on-demand format
- Recognizing that IPDF was not originally intended for change authoring
- Develop a responsive IPDF TO change management process

- Solution:

Sparse Document Concept



The Sparse Document

- Developed to make changes to non-SGML TOs
- Front-end change mechanism for IPDF TOs
Migrates TOs to SGML publishing environment
- Document changes are relatively quick and inexpensive
- The Sparse process automatically generates the “A” page, TOC, LOI, and LOT in IPDF TOs



The Sparse Document (Cont.)

- Developed by AF PDSM Program Office for use in JCALS
- All TO data is created, edited and composed in native SGML
- Process Occurs One Time Per non-SGML TO
- Allows IPDF TOs to migrate to a full SGML document format



Recommended Tools

- Document Type Definitions (DTD)s, Formatting Output Specification Instances (FOSI)s, and the sparse process code
- COTS products currently on JCALS system
 - SGML Aware Programming Language: Omnimark from Software Exoterica
 - SGML Aware Editor: Adept Editor from Arbortext
 - SGML Aware Publishing Engine: DLcomposer from Datalogics



Sparse Document Process

- Change to IPDF TO is required
- Change is authored in SGML
- Change exported to Postscript
- Distill Postscript file to PDF
- Incorporate digital change in PDF file
- Relink TO



Sample SGML Instance Without an “SGML-Aware Editor”

```
<doc docid="template-sparse"><front><idinfo>  
<tmidno>1F15-XX-XX-X</tmidno>  
<doctype>Maintenance Manual  
<maintlvl>ORGANIZATIONAL MAINTENANCE  
<prtitle><subject>DEMO TEXT</prtitle>  
<mfr>PDSM <contractno>XXXX-11111-1  
<distrib>Distribution authorized to the Department  
of Defense and US DoD contractors only...  
<expcont>&expcontnot;</expcont>  
<destr>Comply with distribution statement and ...
```



Sample SGML Instance With an “SGML-Aware Editor”

doc docid=“template-sparse”

front

idinfo

tmidno

1F15-XX-XX-X

tmidno

doctype

Maintenance Manual

maintlvl

ORGANIZATIONAL MAINTENANCE

prtitle

subject

DEMO TEXT

subject

prtitle

mfr

PDSM

mfr

contractno

XXXX-11111-1

contractno

distrib

Distribution authorized to the Department ...

distrib



Key Benefits of Sparse Document

- Permits IPDF changes w/o returning to paper
- Easy, quick, and inexpensive to use
- Migrates legacy TOs to SGML format as required
- Part of the bridge between PDF and SGML



Summary

- Forces compliance to existing standards
- Think long-term, think life-cycle
- Uses JCALS infrastructure for legacy IPDF TO changes
- Technical Manual Specifications and Standards (TMSS) portion of the AF PDSM PO Home Page:
<http://wpcdso1.wpafb.af.mil>



Having identified a Sparse Document approach to changing IPDF TOs, we need to field IPDF legacy TOs to operational bases

“To boldly go where no one has gone before.”



Deploying and Sustaining Digital Legacy Data

- Deployment Goals
- Deployment Assumptions
- Digital Legacy Data Fielding Study
- Digital Legacy Data Sustainment Approach
- Digital Legacy Data Fielding Pilot
- Summary



Deployment Goals

- Conduct study to determine field-level capabilities and requirements necessary for personnel to receive and view digital legacy data
- Develop and establish sustainment approach for digital legacy data
- Educate personnel on the use and sustainment of digital legacy data
- Conduct pilot programs to field and sustain digital legacy data at earliest opportunity



Deployment Assumptions

- Use existing base infrastructure to field digital legacy data
- Establish sustainment process prior to fielding digital legacy data
- Operational environments may vary in their application of digital legacy data



Digital Legacy Data Fielding Study Objectives

- Identify procedures for using digital legacy data at the field level
- Survey operational sites
 - Define potential uses of digital legacy data
 - Identify User Requirements
 - Define Resource Requirements



Digital Legacy Data Fielding Study Objectives (cont'd.)

- Demonstrate use of digital legacy data
- Identify pilot opportunities



Digital Legacy Data Fielding Study

- Operational sites surveyed
 - Seymour Johnson AFB - F-15E
 - Tinker AFB - E-3 AWACS
 - Dover AFB - C-5



Digital Legacy Data Fielding Study

- Lessons learned
 - Current change management procedures labor intensive
 - Existence of multiple TO libraries
 - System of supplements is problematic for field users and TO Distribution Offices
 - Communications & computer infrastructure varies between bases and needs improvements
 - Nature of work dictates type of media used
 - Training is a requirement for digital legacy data fielding, use, and sustainment



Digital Legacy Data Fielding Study

- Proposed procedures for using digital legacy data
 - Centralize distribution of digital legacy data
 - Consider back-shop maintenance environment
 - Deploy proper infrastructure to meet job requirements
 - Implement print-on-demand in aircraft maintenance facilities
 - In-flight use of digital legacy data must be carefully approached
 - Deploy with FAA regulations in mind
 - Consult aircraft manufacturer
 - Select TOs with caution



Digital Legacy Data Sustainment Approach

- Considerations

- Numerous variations on the theme create many possible solutions
 - Infrastructure: on-line vs no connectivity
 - TO maintenance: organic vs contractor maintained
- Asynchronous implementation/time phased
 - Availability of IPDF TOs
 - Contracts modification



Digital Legacy Data Sustainment Approach

- Basic Approach

- Constants

- Focus on sustaining IPDF TOs
- Mixed environment of digital and paper users

- Change management strategy is evolving

- CTOM consensus to improve the TO process

- Sustainment using block cycle updates and rapid action changes
- Eliminate supplements



Digital Legacy Data Sustainment Approach

- Current Efforts

- To provide an improved method for conducting change management which will
 - Incorporate existing supplements as change pages
 - Eliminate future supplements
 - Sustain IPDF TOs
 - Block Cycle Updates
 - Rapid Action Changes

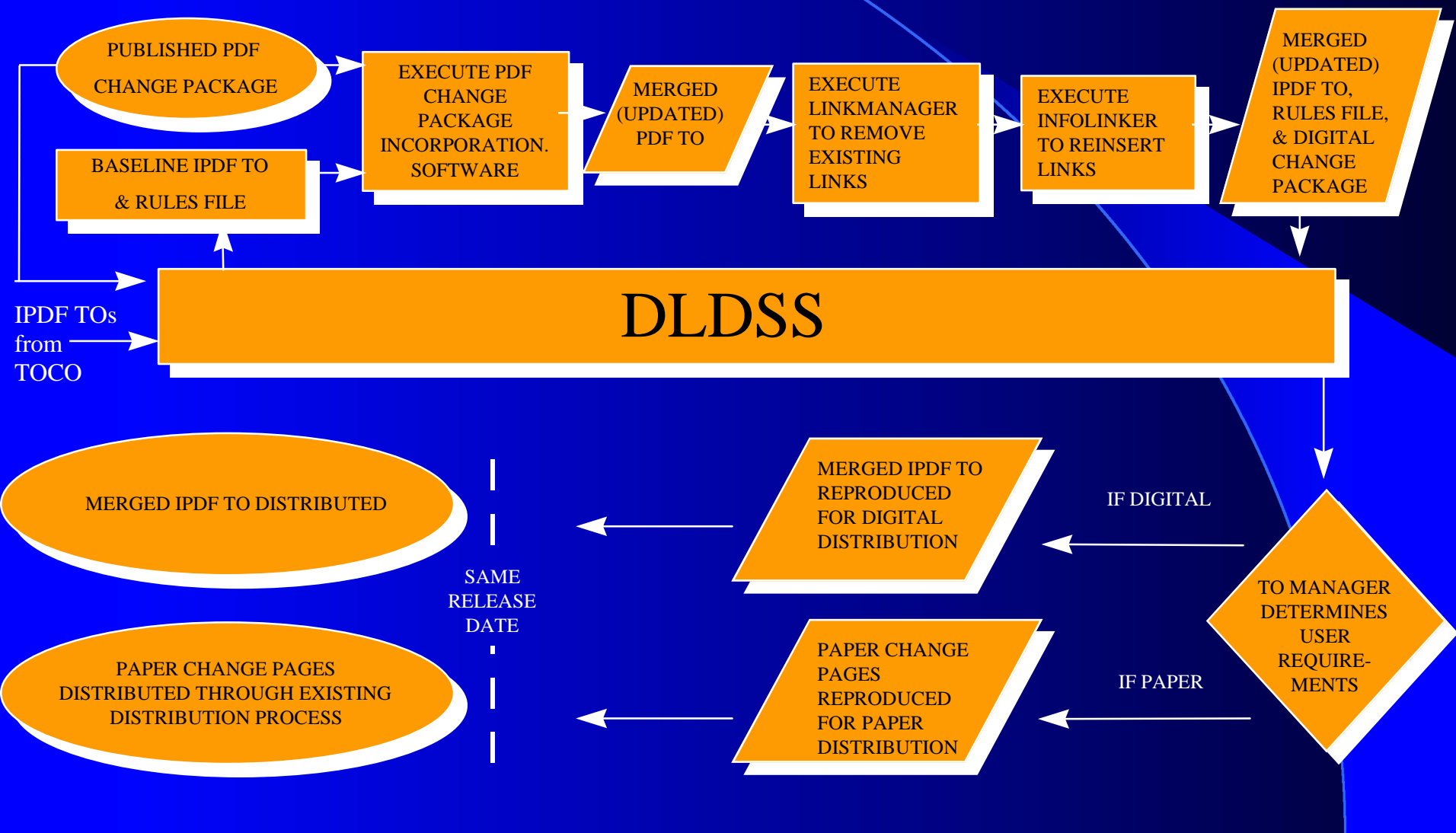


Digital Legacy Data Sustainment Approach

- PDSM Program Office Initiatives:
 - Improve acquisition approach for source data which dictates delivery of PDF change pages
 - PDF change page incorporation software to digitally incorporate a PDF change page into an IPDF TO with a minimal amount of user intervention

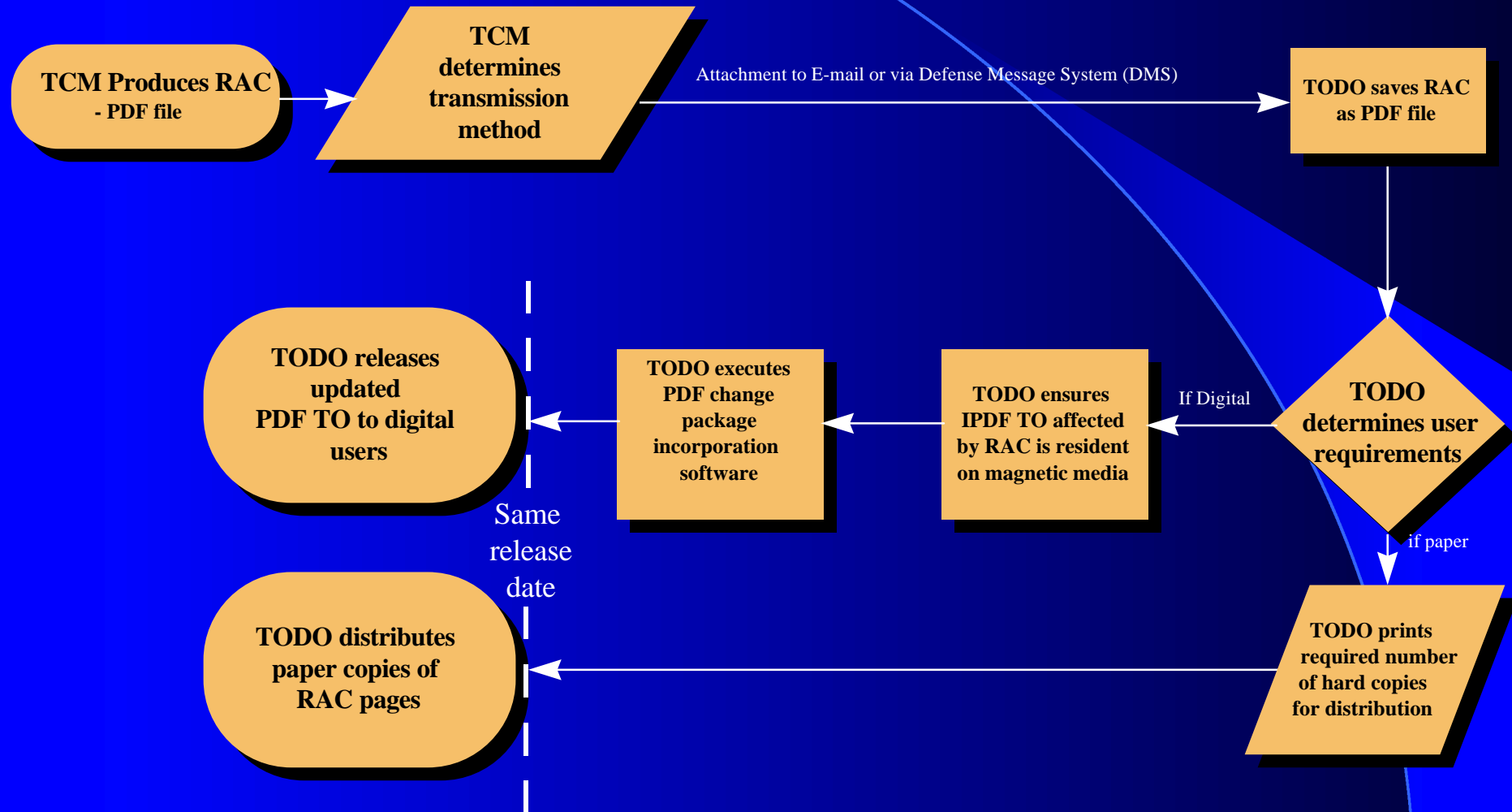


BLOCK CYCLE UPDATE





Digital Legacy Data Sustainment Approach





Digital Legacy Data Fielding Pilot

- Objective

- Conduct pilot project to establish change management and fielding of IPDF TOs at an operational base



Digital Legacy Data Fielding Pilot

- Considerations
 - Well defined scope
 - Availability of IPDF TOs
 - Accepted sustainment approach
 - Block Cycle Updates (BCUs)
 - Rapid Action Changes (RACs)
 - Supporting infrastructure
 - Customer commitment



Digital Legacy Data Fielding Pilot

- E-3 LAN Project (Tinker AFB)
 - Use digital legacy data on board aircraft
 - Project is well scoped
 - Customer commitment
 - Build-up of expertise
 - Expand to back-shops
 - Future migration to other pilot programs



Digital Legacy Data Fielding Pilot

- Fielding and sustaining requirements for E-3 LAN project
 - Current IPDF TOs
 - Key player understanding of sustainment approach (BCU / RAC)
 - PDF change pages
 - PDF change page incorporation software
 - Re-indexing capabilities



Digital Legacy Data Fielding Pilot

- E-3 LAN Project Fielding & Sustainment Approach
 - Cultivate cooperative team effort
 - Identify and convert TOs
 - Field sustainment capability
 - Field digital legacy data
 - Expand customer base
 - Recommend future pilots and initiatives



Deploying Digital Legacy Data Summary

- Understand your customer base
 - Multiple customers involved in fielding
- Digital legacy data provides opportunities for process improvement
 - Less time to field changes
- Develop a plan for keeping published digital legacy data current
 - Sustainment is key to fielding digital legacy data



Deploying Digital Legacy Data Summary

- Change in philosophy and business processes does not occur overnight
 - Cooperation among all customers is vital
- Scope the fielding effort initially, until confidence and reliability is built on digital legacy data
 - Fielding digital legacy data must be done incrementally
- Every base is different as well as every command
 - Fielding solutions will vary among organizations



Conclusion

- Goal is to migrate legacy TO data to an IPDE
- Scope the LDM effort
- Plan for LDM conversion, fielding, and sustainment
- Document approach in a plan and publicize it
- Convert legacy data to digital form
 - Use standards
 - Use centralized approach



Conclusion

- Deploy legacy data
 - Use a pilot project approach
- Sustain digital legacy data
 - Consider process re-engineering
 - Use standards
 - Lock onto faster, cheaper, and better processes



AF PDSM www Page

<http://www.pdsm.wpafb.af.mil>

- AF PDSM Office
- ATOS & JCALS
- EDCARS & JEDMICS
- Tech Order Conversion
- Digital Data Mgt
- AF TO Practices & Procedures
- IPDE/CALS Tutorial
- TMSS
- Training
- Technical Advice
- IPDE/CALS Links
- Fielding & Sustaining Digital TOs

DSN 787-3085 Comm (513) 257-3085 FAX (513) 257-5881



Acronyms For Inquiring Minds

ADP	Automated Data Processing
ANSI	American National Standards Institute
ASC	Accredited Standards Committee
ASCII	American Standard Code for Information Interchange
ASIC	Application Specific Integrated Circuit
ASME	American Society of Mechanical Engineers
ATOS	Automated Tech Order (TO) System
BCU	Block Cycle Updates
CAC	Contractor's Approach to CALS
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CALS	Continuous Acquisition and Life-Cycle Support
CALSIP	CALS Implementation Plan
CAM	Computer Aided Manufacturing
CCITT	Consultative Committee on International Telegraphy and Telephony
CDRL	Contract Data Requirements List
CD ROM	Compact Disk Read Only Memory
CE	Concurrent Engineering
CGM	Computer Graphics Metafile
CIM	Corporate Information Management/Computer Integrated Manufacturing
CITIS	Contractor Integrated Technical Information Service
CLIN	Contract Line Item Number



Acronyms For Inquiring Minds

COTS	Commercial Off The Shelf
DFARS	Defense Federal Acquisition Regulation Supplement
DID	Data Item Description
DISA	Defense Information System Agency
DISN	Defense Information Systems Network
DLA	Defense Logistics Agency
DLDSS	Digital Legacy Data Storage System
DMRD	Defense Management Review Decision
DoD	Department of Defense
DoDI	Department of Defense Instruction
DTD	Document Type Definition
EC	Electronic Commerce
ECP	Engineering Change Proposal
EDCARS	Engineering Data Computer Assisted Retrieval System
EDI	Electronic Data Interchange
EDIF	Electronic Design Interchange Format
EDIFACT	Electronic Data Interchange For Administration, Commerce, and Transport
EDMO	Engineering Data Management Office
FAR	Federal Acquisition Regulation
FDDI	Fiber Optic Distributed Data Interface
FEA	Functional Economic Analysis
FIPS	Federal Information Processing Standard
FOSI	Formatting Output Specification Instance



Acronyms For Inquiring Minds

GCO	Government Concept of Operations
GDMS	Global Data Management System
GFI	Government Furnished Information
IAW	In Accordance With
IC	Integrated Circuit
IDEF	ICAM (Integrated Computer Aided Manufacturing) Definition Language
IEEE	Institute of Electrical and Electronics Engineers
IETM	Interactive Electronic Technical Manual
IGES	Initial Graphics Exchange Specification
ILS	Integrated Logistics Support
IP	Internet Protocol
IPC	Institute for Interconnecting and Packaging Electronic Circuits
IPD	Integrated Product Development
IPDE	Integrated Product Data Environment
IPDF	Indexed Portable Document Format
ISO	International Standards Organization
ITO	Instructions To Offerors
IWSDB	Integrated Weapon Systems Database
IWSM	Integrated Weapon Systems Management
JCALs	Joint Computer-aided Acquisition and Logistics Support
JEDMICS	Joint Engineering Data Management and Information Control System
LAN	Local Area Network



Acronyms For Inquiring Minds

LD	Legacy Data
LDM	Legacy Data Management
MIS	Management Information System
OPR	Office of Primary Responsibility
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
OSI	Open Systems Interconnection
OUSD (A&T)	Office of Under Secretary of Defense (Acquisition and Technology)
PDES/STEP	Product Data Exchange Using STEP
PDF	Portable Document Format
PDL	Page Description Language
PDSM	Product Data Systems Modernization
PM	Program Manager
QA	Quality Assurance
RAC	Rapid Action Change
RFP	Request For Proposal
RFW	Request for Waiver
ROI	Return on Investment
SGML	Standard Generalized Markup Language
SM	Single Manager



Acronyms For Inquiring Minds

SOW	Statement Of Work
STEP	Standard Exchange of Product Model Data
SWP	Strategic War Planning (JCAL software term)
TCP	Transmission Control Protocol
TDP	Technical Data Package
TEMP	Test and Evaluation Master Plan
TMCR	Technical Manual Contract Requirements
TO	Technical Order
TOCO	TO Conversion Operations Facility
TODA	TO Distribution Account Manager
TODO	TO Distribution Organization
TOMA	Technical Order Management Agency
TRM	Technical Reference Model
3D	Three-Dimensional
VECP	Value Engineering Change Proposal
VHDL	VHSIC Hardware Description Language
VHSIC	Very High Speed Integrated Circuit
WAN	Wide Area Network
WBS	Work Breakdown Structure
WORM	Write Once Read Many
WWW	World-Wide Web